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Dated

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Patent
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P01/7700 0.00-0200922.3

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1. Your reference

CMYK

2. Patent application

(7b)

0200922.3

AUTOSORT AS
16 JAN 20023. Full names and postcode of the or of each applicant (*underline all surnames*)TITECH AUTOSORT AS
RYENSVINGEN 11b
N-0680 OSLO
NORWAYPatents ADP number (*if you know it*)

If the applicant is a corporate body, give the country/state of its incorporation

8305146001

4. Title of the invention

METHOD AND APPARATUS

5. Name of your agent (*if you have one*)*"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)*ANTHONY BURROWS
BUSINESS CENTRE WEST
AVENUE ONE, BUSINESS PARK
LEITCHWORTH GARDEN CITY
HERTFORDSHIRE
SG6 2HBPatents ADP number (*if you know it*)

316666001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (*if you know it*) the or each application number

Country

Priority application number
(*if you know it*)Date of filing
(*day / month / year*)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(*day / month / year*)8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (*Answer 'Yes' if:*

YES

- a) any applicant named in part 3 is not an inventor, or
 - b) there is an inventor who is not named as an applicant, or
 - c) any named applicant is a corporate body.
- See note (d))

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Description

5

Claim(s)

Abstract

Drawing(s)

9

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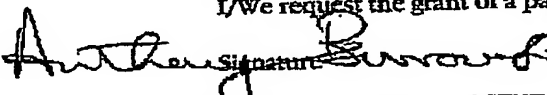
Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)Request for preliminary examination and search (*Patents Form 9/77*)Request for substantive examination (*Patents Form 10/77*)Any other documents
(*please specify*)

11.

I/We request the grant of a patent on the basis of this application.



Date

(ANTHONY BURROWS - AGENT)

16 JANUARY 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

CHRISTOPHER BROTHERS
01462 481755**Warning**

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METHOD AND APPARATUS

This invention relates to CMYK-printed matter.

To obtain the desired quality of recycled paper it is necessary to sort the waste paper objects into different classes. One important class is objects that can be used in production of de-inkable pulp. This quality should consist of newsprint, magazines and white ledger paper, and thus not contain objects of cardboard, flexoprinted paperboard, or coloured paper. Today the sorting process is to a large degree carried out manually.

According to a first aspect of the present invention, there is provided a method comprising identifying CMYK-printed matter by irradiating the matter with radiation which is varied by the matter differently if the matter is CMYK-printed than if the matter is not CMYK-printed.

According to a second aspect of the present invention, there is provided apparatus for use in identifying CMYK-printed matter, comprising radiation-emitting means serving to emit radiation which is varied by the matter differently if the matter is CMYK-printed than if the matter is not CMYK-printed, and detecting means serving to detect the varied radiation.

Owing to these aspects of the invention, it is possible to identify CMYK-printed matter in an automatic manner.

According to a third aspect of the present invention, there is provided a method of separating, from a mixture of objects, CMYK-printed objects from objects which are not CMYK-printed, comprising advancing said mixture, determining,

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using radiation, whether a portion of said mixture is a CMYK-printed object, and separating from the mixture the CMYK-printed objects as desired portions of the mixture.

According to a fourth aspect of the present invention,
5 there is provided apparatus comprising means for producing advancement of a mixture of CMYK-printed objects and objects which are not CMYK-printed, means which uses radiation to determine whether a portion of the mixture is a CMYK-printed object, and means for separating from the mixture the CMYK-
10 printed objects as desired portions of the mixture.

Owing to these aspects of the invention, it is possible to sort out CMYK-printed objects from other objects in an automatic manner and so avoid manual sorting, which is not only costly but also unattractive work.

15 In order that the present invention may be clearly and completely disclosed, reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 shows diagrammatically a system for identifying a CMYK-printed paper object, with a view to separating it
20 from objects which are not CMYK-printed or are not paper objects,

Figure 2 is a graph of normalised light intensity plotted against wavelength and showing visible light absorption spectra for the basic colours Cyan, Yellow and
25 Magenta of the CMYK colour range,

Figures 3 and 4 are graphs showing respective examples of spectra of combined CMYK colours,

Figures 5 and 6 are graphs showing respective examples

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of spectra of non-CMYK colours,

Figures 7 and 8 are graphs showing spectra of brown cardboard and grey cardboard, respectively, and

Figure 9 is a graph showing a spectral response in an
5 example of the present method.

We propose a technique to discriminate between different classes of recycled paper, e.g. the de-inkable class and the unwanted material, based on the spectral properties in the visible region of the CMYK colours. CMYK is named after the
10 colours Cyan, Magenta, Yellow and Carbon Black that result from the colour separation process used in most image rendering printing processes today. The colours obtained by the CMYK printing process can to a large extent be identified by properties in the visible spectrum distinguishing them
15 from colours of tinted paper materials and paper objects printed by a premixing process. This colour distinguishing technique may employ a system such as disclosed in International Patent Application Publication WO96/06689; of course, visible light would be employed rather than IR.
20 Moreover, this colour distinguishing technique may be combined with a technique using IR (infrared)-properties to remove paperboard objects (mainly food containers) printed by the CMYK process but having some form of plastics coating. The latter technique could be that disclosed in WO96/06689.
25 A scanning system combining both techniques is shown in Figure 1. In the system shown, a mixture of various cellulosic sheets (S) are advanced continuously on a conveyor belt 1 past a detection station 2 having a scanner 3 which

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scans the stream of the advancing mixture transversely of the belt 1 and includes two analysis units 4 and 5. The radiation in the beam B reflected from the belt 1 and the sheets (S) has its visible light spectrum used by the unit 4 to identify

5 CMYK-printed cellulosic sheets and has its IR spectrum used by the unit 5 to identify such sheets as plastics-coated cellulosic sheets. In this manner, it is possible to leave, as a main stream, only CMYK-printed paper sheets, black-and-white paper sheets and white paper sheets.

10 Newsprint and magazines are to a large extent CMYK printed, or printed in carbon black. Thus these may be distinguished from most other coloured paper objects by detecting the CMYK print. As mentioned CMYK may be distinguished from most other colours by the characteristics

15 of the spectrum in the visible region. Figure 2 shows spectra for the three basic colours Cyan (dashed line), Yellow (solid line) and Magenta (dot-dash line). Figures 3 and 4 show examples of spectra of images printed by the CMYK colours, whereas Figures 5 and 6 show spectra of non-CMYK

20 colours, Figure 7 shows a typical spectrum of brown cardboard, and Figure 8 shows a typical spectrum of grey cardboard.

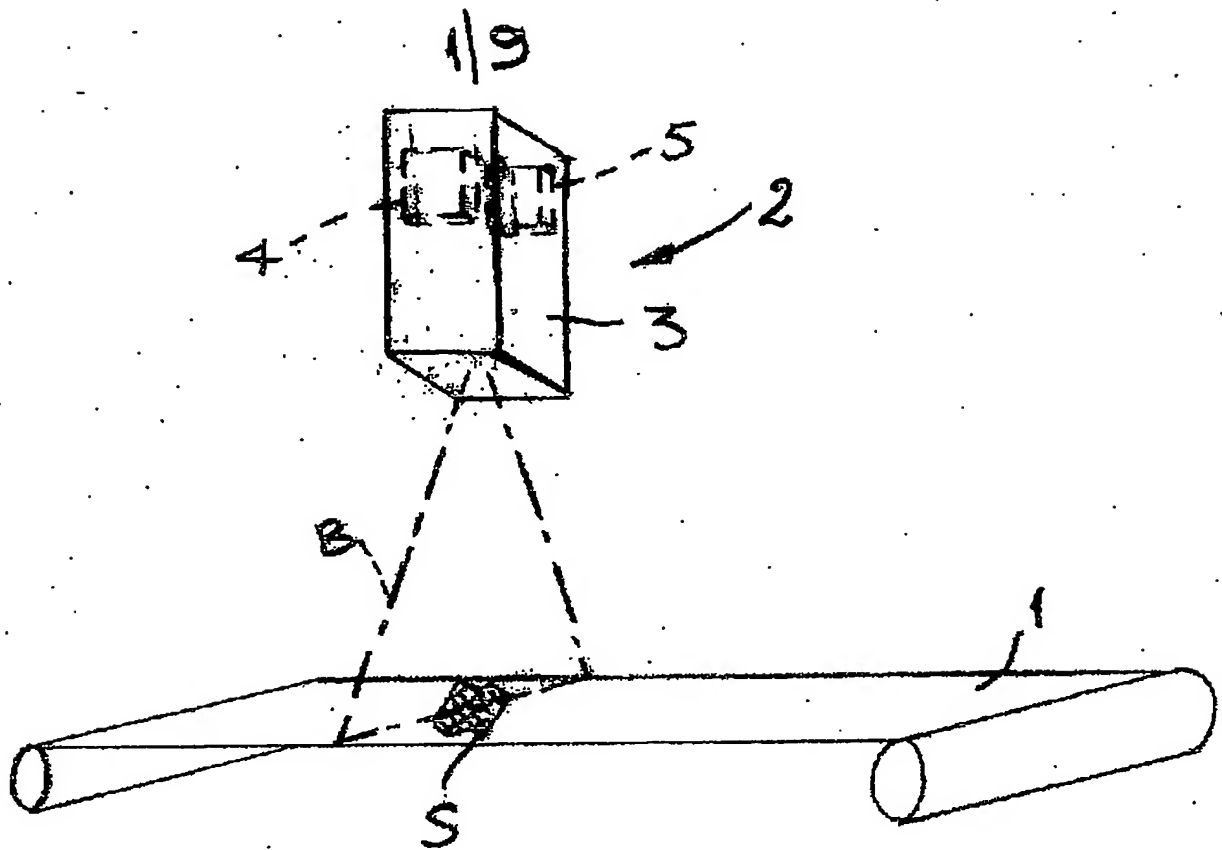
As a measure of the "CMYK content" of a colour we detect the differences of the spectrum intensities among two or more

25 of a multitude of narrow-frequency-band channels. The channels may be produced by light sensors fitted with narrow-band transmission or reflection filters, or by placing sensors in selected positions along a spectrum generated by

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a dispersive element such as a grating or a prism. The number of channels is advantageously 5, 6 or more. Figure 9 shows the spectral response of a practical example with 5 channels, superposed on spectra of a typical CMYK colour spectrum (dashed line) and a non-CMYK spectrum (solid line) of a coloured paper.

One criterion for discriminating between CMYK and non-CMYK colour is differences among the levels of intensity in two or more of the channels, e.g. $(Ich2 - Ich1)$, $(Ich4 - Ich3)$ and $(Ich5 - Ich4)$. Here, Ich_n means the intensity measured in channel n . Other combinations of sums and differences of channel intensities may be chosen according to the type and number of paper qualities to be sorted.



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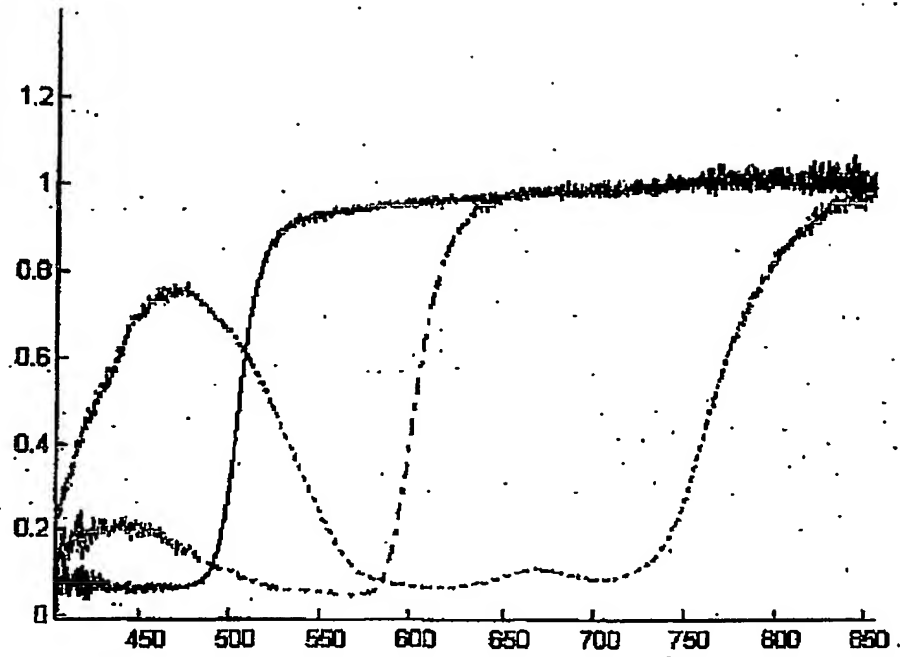


Fig. 2.

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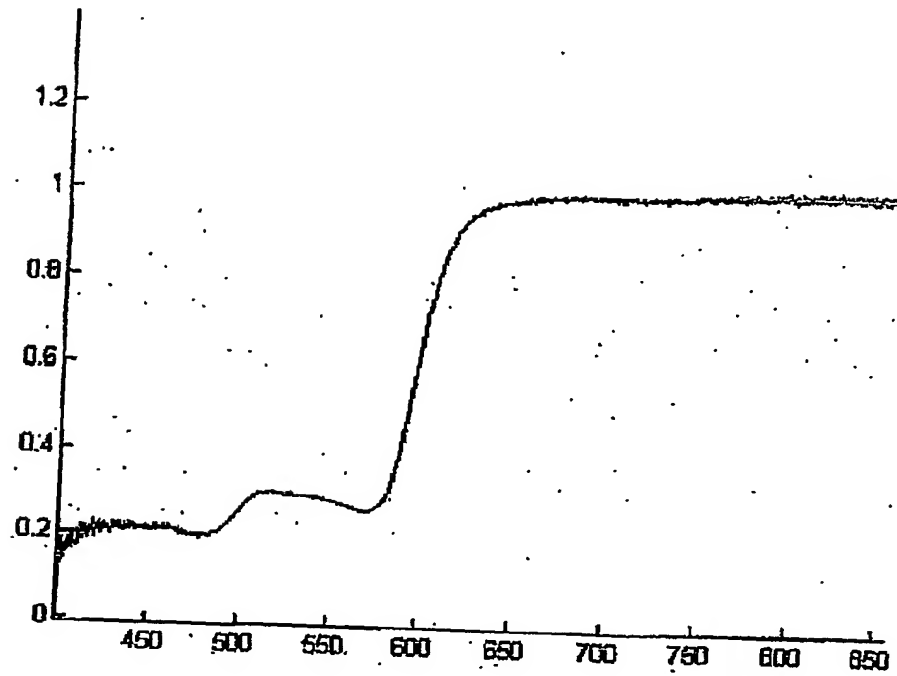


Fig. 3.

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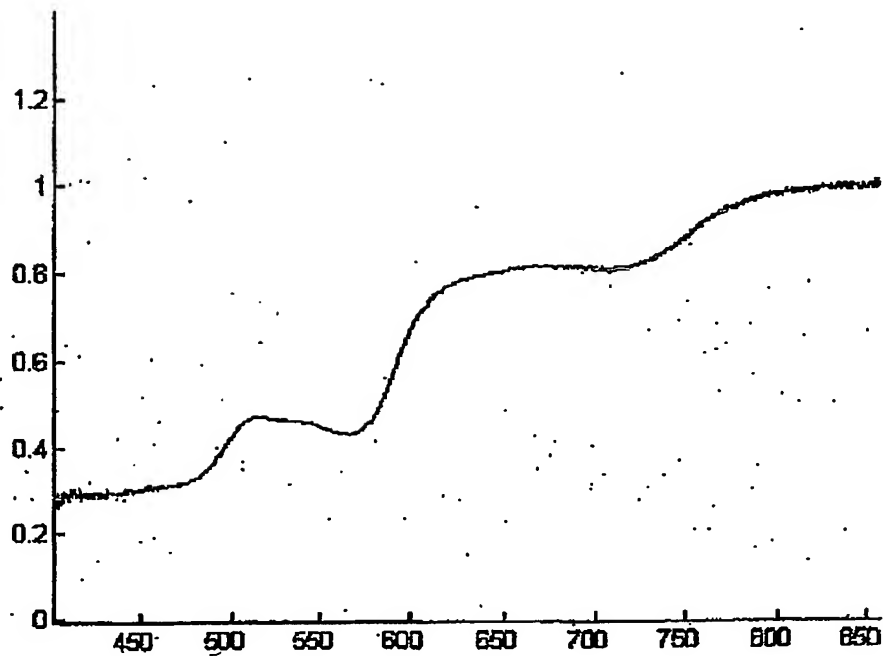


Fig. 4.

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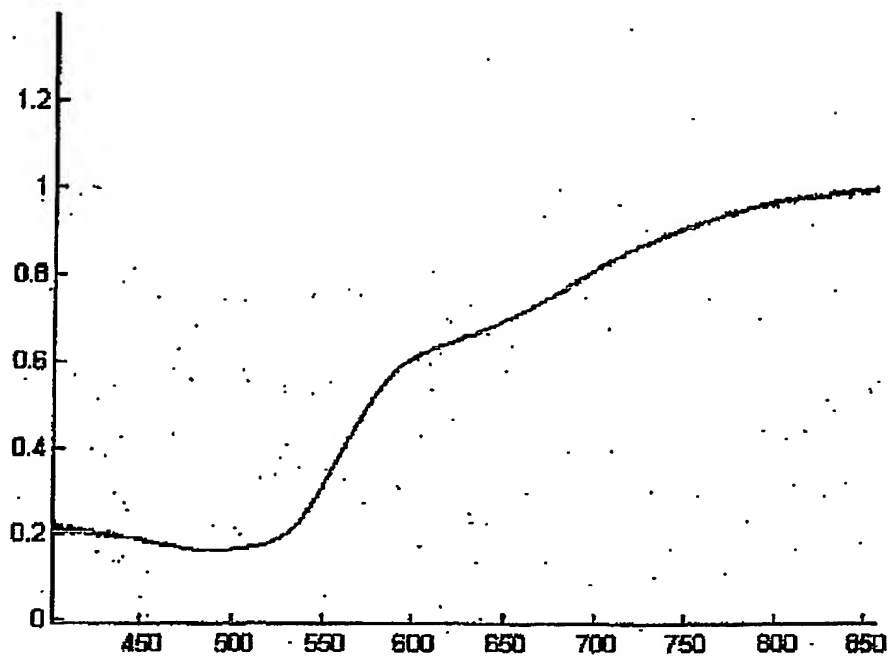


Fig. 5.

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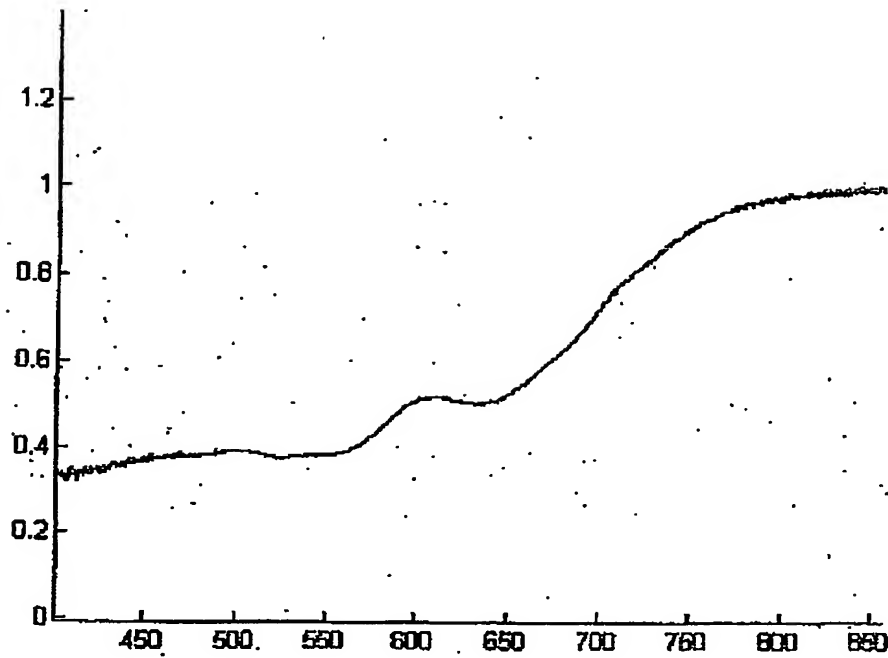


Fig. 6.

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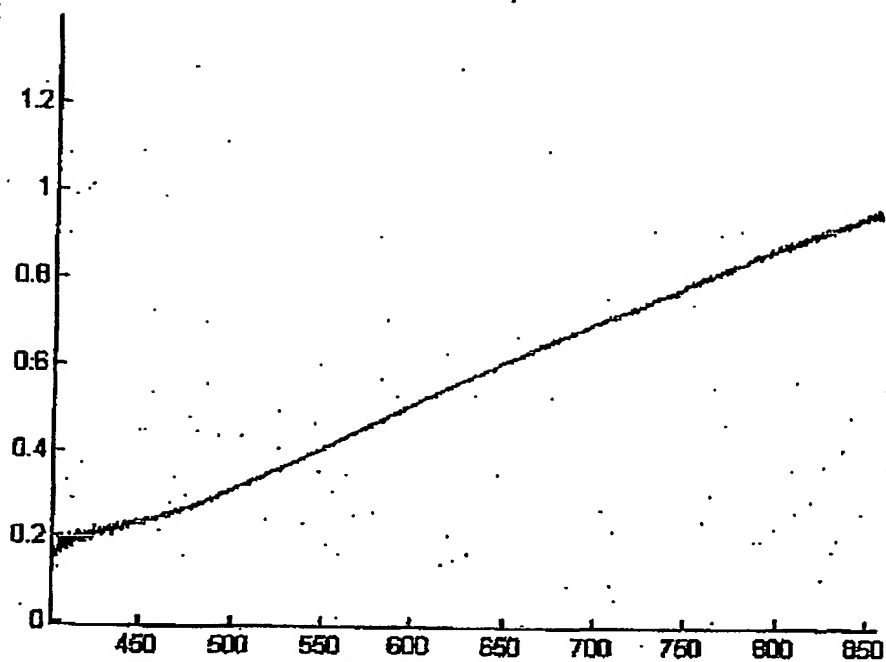


Fig. 7.

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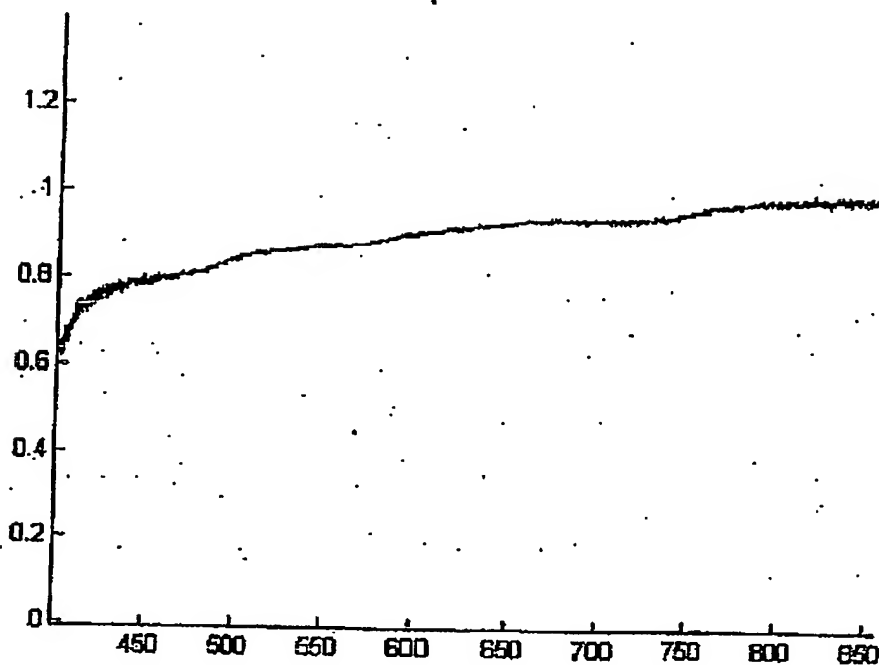


Fig. 8.

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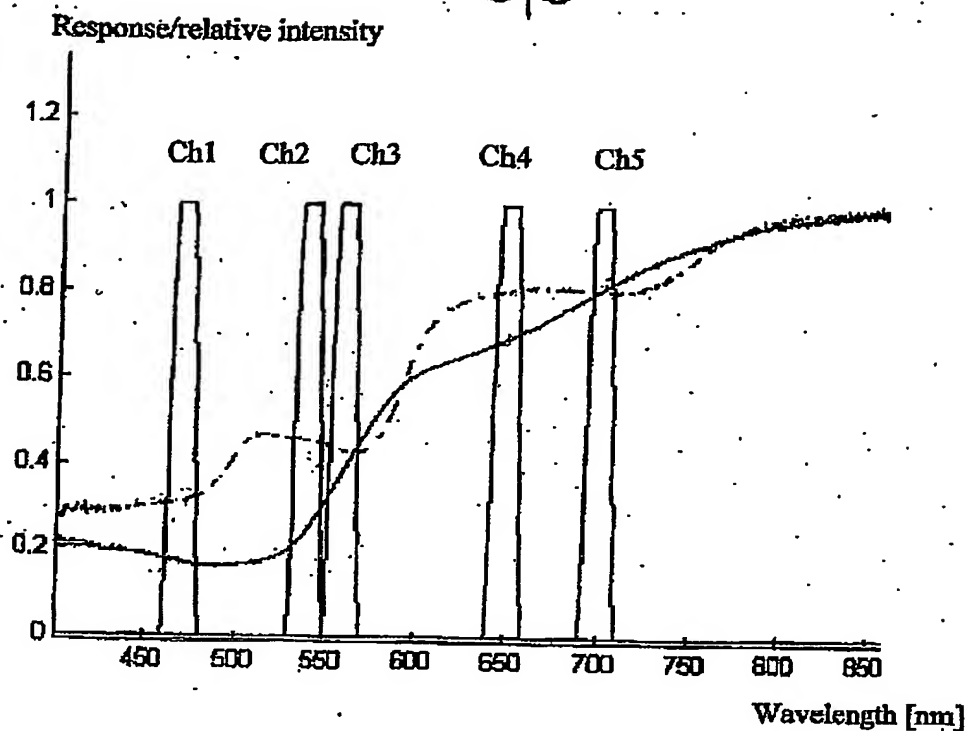


Fig. 9

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